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PATENT APPLICATION

16 April 1974

To: Hideo Saito, Director of the Patent Office

1. Title of the Invention

An Alkaline Battery

2. Inventor

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4. List of Attached Documents

(1)	Specification	1 copy	
(2)	Figures	1 copy	(Seal affixed)
(3)	Duplicate	1 copy	

49-043190

Specification

Title of the Invention: An Alkaline Battery

2. Claim

An alkaline battery in which a coating film of a nickel oxide is formed on the surface that is connected with the insulated packing of a nickel-plated negative electrode [anode] sealing plate.

3. Detailed Description of the Invention

This invention provides an alkaline battery with improved resistance to fluid leakage, which is an alkaline battery in which zinc is the anode active substance and an alkaline aqueous solution is the electrolytic solution, for example, an alkaline manganese battery, a mercury oxide battery or a nickel-zinc battery, and in which a coating film of a nickel oxide is formed on the surface that is connected with the insulated packing of a nickel-plated anode sealing plate.

In conventional alkaline batteries, so that the alkaline electrolytic solution does not leak to the outside of the anode terminal due to the electric capillary action on the anode side, studies were made for making stronger the insulating packing materials of mechanical sealing and tightening. Insulated packings such as plastics were adhered securely by molding to the anode sealing plate and adhesive agents were applied between the insulated packing and the anode sealing plate to effect sealing. However, in small alkaline batteries, the leakage of electrolytic solution could not be completely prevented by conventional

insulated packing materials due to the conditions of long-term storage or use. Further, when the seal opening was tightened solely by mechanical force, the insulating packing material underwent changes in gauge, minute gaps developed in the contact surface between the anode sealing plate and the insulated packing and there was leakage of the electrolytic solution. Even when an adhesive agent was applied to the contact surfaces between the anode sealing plate and the insulated packing, there were the drawbacks that there was poor adhesion of the adhesive agent with the anode sealing plate and the insulated packing so that fluid leakage accidents occurred during long-term storage of the battery or during use at high temperatures.

In this invention, a nickel oxide film of several μ in thickness which is produced by chemical or electrical methods on the surface that is in contact with the insulated packing of the anode sealing plate, which is a nickel plate, with adhesion between the anode sealing plate and the insulated packing being improved and with leakage of electrolytic solution to the outside from the edges of the anode sealing plate being prevented. We shall now describe an example of this invention.

In Figure 1, reference (1) is the anode sealing plate, which is a nickel-plated steel plate, (2) is a nickel oxide film, which is formed by electrolytic oxidation of the edges of the anode sealing plate (1) in an aqueous solution of a caustic alkali, (3) is an alkali-resistant insulated packing comprised of rubber or plastic such as, for example, Neoprene rubber, polyethylene resin or polypropylene resin, (4) is the cathode container which is nickel-plated on iron,

(5) is the cathode compound comprised of 90 parts of mercury oxide, 8 parts of flake graphite and 2 parts of polystyrene, (6) is partition paper, (7) is a layer impregnated with electrolytic solution comprised of natural or synthetic resin holding a caustic alkaline electrolytic solution, (8) is a zinc anode and (9) is the sealed battery in which the insulated packing (3) is tightened by bending of the cathode container (4) inwards under pressure.

Next, mercury batteries of this invention (A) as described above and conventional mercury batteries (B) that did not have an oxide film on the edges of the anode sealing plate were assembled in the H-O* form as designated by the JIS [Japanese Industrial Standard] and the number of instances of fluid leakage in 100 batteries was compared after storage for 6 months in a constant temperature chamber at 45°C and 75% humidity. When this was done, the number of batteries with leakages was 5 for the batteries of this invention (A) and 65 for the conventional batteries (B), with resistance to fluid leakage of the batteries of this invention (A) being extremely good.

As indicated above, in this invention, films of nickel oxides such as NiO_2, Ni_2O_3 and Ni_3O_4 ** are formed by oxidation or heating of the edges of the nickel-plated anode sealing plate by electrolytic oxidation or oxidizing agents such as sodium hypochlorite or potassium permanganate. Therefore, there is no danger of peeling of the nickel-plated layer, a surface of nickel oxide film is formed on the metal surface of the anode sealing plate in which the smallest nonuniform irregularities are of a few μ in thickness, the [illegible] insulated packing is

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* slightly illegible—Trans. Note.

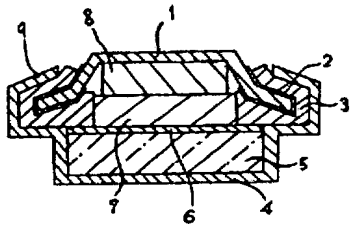
** Subscripts are mostly illegible. Formulas of most common nickel oxides are used.—Trans. Note

strongly adhered to the irregular surface of the oxide film and fluid leakage to the outside by oozing of electrolytic solution from the edges of the anode sealing plate is prevented. Therefore, the invention is of great industrial value.

4. Brief Explanation of the Figure

The figure is a cutaway cross-sectional view of a mercury battery which is one example of the alkaline battery of this invention.

(1) – anode sealing plate; (2) – nickel oxide film; (3) insulated packing.



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⑲ 日本国特許庁

公開特許公報

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特 許 願 (特)

昭和49年4月16日

許庁長官 殿

1. 発明の名称 アルカリ電池

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4. 添付書類の目録
(1) 明細書 1通
(2) 図面 1通
(3) 願書 1通

49-043190

明 細 書

1. 発明の名称 アルカリ電池

2. 特許請求の範囲
ニッケルメッキした陰極封口板の絶縁パッキングと接する表面にニッケル酸化物の被膜を形成してなるアルカリ電池。

3. 発明の詳細な説明
本発明は亜鉛を陰極活物質とし、アルカリ水溶液を電解液とするアルカリ電池例えばアルカリマンガン電池、酸化水銀電池、ニッケル亜鉛電池において、ニッケルメッキした陰極封口板の絶縁パッキングと接する表面にニッケル酸化物の被膜を形成して耐漏液性能を向上せるアルカリ電池を提供するにある。
従来この種アルカリ電池においては、陰極側の電気毛管作用による陰極端子外面へアルカリ電解液が匍匐しないように、絶縁パッキングの材質あるいは機械的に封口締付けを強固にする等の検討がされ、またゴム、プラスチック等の絶縁パッキングを陰極封口板の周縁にモールドにて強固に密着したり、絶縁パッキングと陰極封口板との間に接着剤を塗着して封口をしていた。しかし従来の絶縁パッキングの材質では小型アルカリ電池では長期貯蔵中あるいは使用の条件によっては電解液の漏液を充分に阻止することができなかった。また封口を機械的強度のみで締付けると絶縁パッキングの材質がクイジ変化と共に陰極封口板と絶縁パッキングとの接触面に微小な間隙が生じ電解液が漏液することがあった。さらに陰極封口板と絶縁パッキングとの接触面に接着剤を塗布したものでも接着剤と陰極封口板および絶縁パッキングとの接着が悪く、電池の長期貯蔵中あるいは高温中使用等に漏液事故を発生する等の欠点があった。
本発明はニッケルメッキした陰極封口板の絶縁パッキングと接する表面に化学的、電気的な方法により数μの厚さでニッケル酸化物の被膜を形成して陰極封口板と絶縁パッキングとの密着性を向上して陰極封口板の周縁より電解液の外

部漏液を阻止するもので、以下本発明の実施例につき説明する。

第1図において、(1)は鉄板にニッケルメッキした負極封口板、(2)は負極封口板(1)の周縁を可性アルカリ水溶液中で電解酸化して形成したニッケル酸化物被膜、(3)は例えばネオプレンゴム、ポリエチレン樹脂、ポリプロピレン樹脂等のゴムまたはプラスチックからなる耐アルカリ性絶縁パッキング、(4)は鉄にニッケルメッキした陽極容器、(5)は酸化水銀90部、鱗状黒鉛8部、ポリステレン2部からなる陽極合剤、(6)は隔離紙、(7)は可性カリ電解液を保持している天然または合成繊維からなる電解液含浸層、(8)は亜鉛陰極、(9)は陽極容器(4)の開口部で内方に加圧折曲して絶縁パッキング(3)を締付けして密封口電池としている。

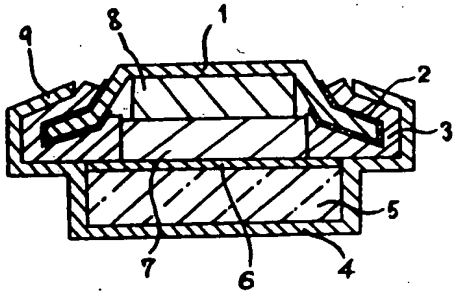
次に上記本発明水銀電池(A)と負極封口板周縁に酸化被膜を有しない従来水銀電池(B)とをJIS名称LR－0形に組立して450、温度75℃の恒温槽中に6ヶ月間貯蔵後における電池100ケ中の漏液個数を比較すると、本発明品(A)は5個で従来品(B)は45個であり、本発明品(A)の耐漏液性はきわめて良好であった。

以上のごとく本発明は、ニッケルメッキ負極封口板の周縁を電解酸化あるいは次亜塩素酸ナトリウム、過硫酸カリウム等の酸化剤による酸化、または加熱による酸化等によってNiO_2、Ni_2O_3、Ni_3O_4等のニッケル酸化物の被膜を形成しているので、ニッケルメッキ層の剥離のおそれがなく、またニッケル酸化物被膜の表面は不均一な微小凹凸が数μの厚さで負極封口板の金属表面に形成され、装着した絶縁パッキングは酸化物被膜の凹凸面に強固に密着し、負極封口板の周縁から電解液が匍匐して外部漏液することを防止せしめる工業的価値の大なるものである。

4.図面の簡単な説明

図面は本発明アルカリ電池の一実施例における水銀電池の縦断面図である。

(1)――負極封口板、(2)――ニッケル酸化物被膜、(3)――絶縁パッキング。



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